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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/715,413	11/19/2003	Ching-Yu Chang	0941-0867P	5321
2292	7590	11/04/2004	EXAMINER	
BIRCH STEWART KOLASCH & BIRCH PO BOX 747 FALLS CHURCH, VA 22040-0747			SARKAR, ASOK K	
			ART UNIT	PAPER NUMBER
			2829	

DATE MAILED: 11/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/715,413	CHANG, CHING-YU	
	Examiner	Art Unit	
	Asok K. Sarkar	2829	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 5-9 and 15-20 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 10-14 is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 November 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION***Election/Restrictions***

1. Applicant's election with traverse of Species II claims 1 – 4 and 10 – 14 in the reply filed on October 8, 2004 is acknowledged. The traversal is on the ground(s) that the examination of all claims in a single application will not be an undue burden. This is not found persuasive because the other claims describe separate inventions and are patentably distinct. Moreover, the applicant did not submit any evidence showing the species to be obvious variants or clearly admit on the record that this is the case. Since the nonelected claims describe a different invention, the Examiner will have to carry out additional searches.

The requirement is still deemed proper and is therefore made FINAL.

Claims 5 – 9 and 15 – 20 were withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected Species claims, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on October 8, 2004.

Drawings

2. Figures 1A, 1B, 2A, 2B, 3A and 3B should be designated by a legend such as -- Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g).

Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.121(d)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the

Art Unit: 2829

examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Koh, US 6,242,344.

Koh teaches a method of forming a dual-layer resist, comprising the steps of:

- providing a substrate 10 (See Fig. 6a);
- forming a patterned first resist layer (62 + 64) on the substrate 10 (See Fig. 6a);
- curing the first resist layer so that the first resist layer does not dissolve in a resist solvent in column 9, lines 10 – 11. The cross-linking of the first resist layer will inherently prevent dissolution of the resist layer in a resist solvent of the second resist; and
- forming a patterned second resist layer 72 (See Figs. 6d and 6e) on the cured first resist layer in descriptions in between column 8, line 63 and column 9, line 17.

5. Claims 1 – 3 are rejected under 35 U.S.C. 102(e) as being anticipated by Yamaguchi, US 6,774,043.

Yamaguchi teaches a method of forming a dual-layer resist, comprising the steps

Art Unit: 2829

of:

- providing a substrate 1 (See Fig. 84);
- forming a patterned first resist layer 31a on the substrate 1 (See Fig. 86);
- curing the first resist layer so that the first resist layer does not dissolve in a resist solvent in columns 23 and 24 under Embodiment 11. The curing/cross-linking of the first resist layer will inherently prevent dissolution of the resist layer in a resist solvent of the second resist; and
- forming a patterned second resist layer 34 (See Figs. 6d and 6e) on the cured first resist layer in descriptions in columns 23 and 24 under Embodiment 11.

Regarding claim 2, Yamaguchi teaches argon ion implantation in column 24, lines 9 – 11.

Regarding claim 3, Yamaguchi teaches performing ion implantation using an energy of 50 keV and dose of 10^{15} ions/cm² in column 25, lines 60 – 66.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

Art Unit: 2829

2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
8. Claims 2 – 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koh, US 6,242,344 in view of Nagase, US 6,136,723.

Koh fails to teach curing of resist by argon ion implantation or argon plasma.

Nagase teaches resist curing by argon ion implantation at an energy of 10 keV for the benefit of avoiding facet formation in column 4, lines 47 – 52. Nagase also teaches resist curing by argon plasma treatment for the benefit of avoiding facet formation in column 10, lines 38 – 47.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Koh and cure the resist by argon ion implantation at an energy of 10 keV for the benefit of avoiding facet formation as taught by Nagase in column 4, lines 47 – 52. It would have been obvious to one with ordinary skill in the art at the time of the invention to modify Koh and cure the resist by argon plasma for the benefit of avoiding facet formation as taught by Nagase in column 10, lines 38 – 47.

It would also have been obvious to one with ordinary skill in the art at the time of the invention to modify Koh and cure the resist by argon ion implantation and judiciously adjust and control the ion implantation dosage parameters at a dose of 10^{13} – 10^{15} ions/cm² during the resist curing process through routine experimentation and optimization to achieve optimum benefits (see MPEP 2144.05) and it would not yield any unexpected results.

Note that the specification contains no disclosure of either the critical nature of the claimed processes or any unexpected results arising therefrom.

Allowable Subject Matter

9. Claims 10 – 14 are allowed.

10. The following is an examiner's statement of reasons for allowance:

Claims 10 – 14 recite, inter alia, a method of forming holes, comprising the steps of providing a first resist layer having substantially parallel first trench patterns on the dielectric layer on a substrate, curing the first resist layer so that the first resist layer does not dissolve in a resist solvent and forming a second resist layer having substantially parallel second trench patterns on the cured first resist layer, wherein the second trench patterns are substantially perpendicular to the first trench patterns. The art of record does not disclose or anticipate the above limitation in combination with other claim elements nor would it be obvious to modify the art of record so as to form a device including the above limitation.

Conclusion

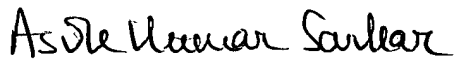
11. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asok K. Sarkar whose telephone number is 571 272 1970. The examiner can normally be reached on Monday - Friday (8 AM- 5 PM).

Art Unit: 2829

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Tokar can be reached on 571 272 1812. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

13. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Asok K. Sarkar
October 27, 2004

Patent Examiner